


Quality Assurance Project Plan Addendum 5

Spokane River Toxics Reduction Strategy Study

Prepared for:
Spokane River Regional Toxics Task Force

Final

Date: July 23, 2018

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APPROVALS

Quality Assurance Project Plan – Addendum 5

July 23, 2018

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Abstract

This Addendum to the Quality Assurance Project Plan (QAPP) corresponds to a continuation in 2018 of the work described in the original QAPP for 2014 (LimnoTech, 2014b), the 2015 QAPP Addendum 1 (LimnoTech, 2015a), the 2016 QAPP Addendums 2 (LimnoTech, 2016a) and 3 (Ecology, 2016), and the 2017 QAPP Addendum 4 (LimnoTech, 2017). The objective of the 2018 Technical Activities is to collect the data necessary to repeat the semi-quantitative mass balance assessments conducted using the 2014 and 2015 Synoptic Survey data, providing supplemental information to address gaps in understanding that exist from the prior studies.

The 2014 QAPP, 2015 QAPP Addendum 1, 2016 QAPP Addendums 2 and 3, 2017 QAPP Addendum 4 and the Sampling and Analysis Plan (SAP) (approved by Ecology and SRRTTF) are still applicable. The revisions contained in this Addendum consist of an additional dry weather sampling event at eleven locations between Barker Road and below the Nine Mile Dam, including a new station downstream of the Upriver Dam.

Introduction

The Spokane River Regional Toxics Task Force (SRRTTF) has developed a comprehensive plan to reduce toxic pollutants in the Spokane River, specifically polychlorinated biphenyls (PCBs). The comprehensive plan is designed to identify specific management actions that can be undertaken to control pollutant loads such that water quality objectives can ultimately be attained. Comprehensive plans of this type require data capable of describing individual sources and site-specific processes that drive resulting concentrations. LimnoTech (2014a) described the overall data collection strategy for a first year of monitoring, based on the work conducted to identify key gaps in the existing data set and issues addressed at a December 2013 monitoring workshop.

A Synoptic Survey was conducted in 2014 to identify potentially significant dry weather sources of PCBs to the Spokane River between Lake Coeur d'Alene and Nine Mile Dam. The results of this study showed the strong likelihood of a groundwater PCB source between Barker Road and the Trent Avenue Bridge, and the potential of an additional groundwater PCB source between the Trent Avenue Bridge and the Spokane USGS gage. No information on potential groundwater PCB sources between the Spokane USGS gage and Nine Mile Dam could be obtained, because fluctuations in river flow caused by maintenance activities at Nine Mile Dam violated the steady state assumption of the study design (LimnoTech, 2015b). The SRRTTF Technical Track Work Group recommended, and the Task Force as a whole, approved (SRRTTF, 2015a, 2015b) conducting a 2015 Synoptic Survey to confirm the findings of the 2014 Synoptic Survey over a narrower spatial scope. This work was conducted in August 2015 in accordance with the 2015 QAPP Addendum 1.

In 2016, monthly water quality sampling was conducted to determine the seasonal variability in PCB concentrations in the Spokane River, to the extent that measured concentrations exceed laboratory blanks. Concurrent collection of flow data allowed for a semi-quantitative assessment of loading. The field monitoring program included six monthly sampling events. QAPP Addendum 2 was prepared to document the procedural and analytical requirements of the 2016 water quality monitoring. The results of the monthly sampling (LimnoTech, 2016c) confirmed the presence of a large (i.e. as large as any other single dry weather source) incremental PCB load entering the Spokane River between Barker Road and the Trent Avenue Bridge, with the location of where the load enters the river narrowed down to between upper Mirabeau Park/Sullivan Road and the Trent Avenue Bridge/Plante's Ferry. Homolog-specific mass balance analyses indicate the potential presence of another groundwater loading source entering the river downstream of the Trent Avenue Bridge, although further study was recommended to assess the nature of this source.

Also in 2016, the Department of Ecology, in collaboration with Spokane County, collected groundwater data from a select set of Spokane Valley-Rathdrum Prairie aquifer wells and springs located adjacent to the Spokane River. The objectives of the study were to 1) characterize PCB concentrations in groundwater at the Idaho-Washington state line, and groundwater inputs to the river upstream of Kaiser Aluminum in Spokane Valley, 2) evaluate groundwater concentrations of PCB in the aquifer near gaining reaches, 3) correlate groundwater measurements with 2015 in-river synoptic studies and mass balance determinations, 4) check for potential sources of PCB contamination in groundwater that might reach the river, and 5) characterize PCB concentrations of source water for the Spokane Fish Hatchery, which discharges to the Little Spokane River. Up to 20 environmental samples were collected in three sampling periods, representative of the Spokane River's three major flow regimes. QAPP Addendum 3 was prepared by the Department of Ecology to document the procedural and analytical requirements of the 2016 groundwater monitoring.

In 2017, a homolog-specific mass balance analysis was conducted to provide additional insight into the presence of other PCB sources beyond that gained from the prior total PCB mass balance analyses. This analysis showed a loading source entering between Trent Avenue (Plante's Ferry) and Greene Street, although results were potentially confounded by the presence of a transition point between the losing and gaining sections of the river in this reach. It was recommended that future synoptic surveys include a sampling location at this transition point. QAPP Addendum 4 was prepared to document the procedural requirements of the 2017 analysis. The 2017 homolog specific mass balance analysis also showed a potential load of penta- and hexa-chloro homologs in the reach between Barker Road and Mirabeau Point, although the calculated load in this reach was driven solely by a single elevated PCB sample at Mirabeau Point. It is not clear whether this represents an anomalous measurement or the presence of an ephemeral groundwater loading source.

The 2018 monitoring described in this QAPP is designed to provide supplemental information to address three gaps in understanding regarding groundwater PCB loading that exist from the prior studies:

1. The potential for groundwater loading sources between the Spokane USGS gage and Nine Mile Dam.
2. The specific nature of groundwater loading sources suspected between Trent Avenue (Plante's Ferry) and Greene Street.
3. The potential for groundwater loading sources between Barker Road and Mirabeau Point.

Project Organization

Each of the organizations included in the project team has established an organizational structure for providing technical direction and administrative control to accomplish quality-related activities for the development of the project.

Key project personnel and their corresponding responsibilities are listed in Table 1 below and shown in Figure 1.

Table 1. Project Team Responsibilities/Distribution List

Name/Affiliation	Project Title/Responsibility
SRRTTF	**Oversight and direction** Secure funding for project activities Review and utilize project results Facilitate communications and provide public access to information Develop recommendations for controlling and reducing sources Develop comprehensive plan
Bud Leber – SRRTTF-ACE	**SRRTTF ACE President** Manage contracts: review and approve project specifications Ensure project is completed in timely manner Receive deliverables and reports Manage data on behalf of SRRTTF Communicate with SRRTTF Communicate quality assurance issues with SRRTTF Ensure access to project information on the SRRTTF website Facilitate upload of data to EIM
David Dilks - LimnoTech	**Project Manager** General oversight Review/approval of all work products prior to delivery to SRRTTF-ACE Ensures that work is done in accordance with QAPP and SAP Reviews project with Laboratory Operations Directors prior to sampling Provides oversight of field activities (variances, documentation, QA/QC) Arranges for system audits
Adriane Borgias– Department of Ecology	**Advisor** Reviews/approves QAPP
Robert Steed – Idaho DEQ	**Advisor** Reviews/approves QAPP
Cathy Whiting - LimnoTech	**Field Manager** Direct all field activities, ensure samples handled in accordance with SAP Data screening, evaluation, validation, and usability determination Manage field variances, nonconformance, and corrective actions Manage reports, documentation, Project QA/QC file, and electronic data Communicates project specifics with Project Manager
Bob Betz - LimnoTech	**Project Quality Assurance Officer** Performs systematic evaluation of data quality Receives notices, initiates investigation, and documents nonconformance with DQOs Manage the Project QA/QC file
LimnoTech	**Independent Auditor** Perform a critical, written evaluation of the work product Conducts audits at the direction of the Project Manager
Shea Hewage – SGS AXYS Analytical Services, Ltd.	**Laboratory Operations Director** Responsible for all aspects of the daily operation of the laboratory. Oversees sample analysis and data reporting in accordance with quality program. Oversees the completion of corrective actions to address any non-conformances. Works closely with the QA Manager and the Account Manager to establish project technical specifications.
Richard Grace – SGS AXYS Analytical Services, Ltd.	**Laboratory Account Manager** Oversight of laboratory commercial terms. Serves as the main point of contact for laboratory for contract management or maintenance. Works closely with laboratory management to develop project technical specifications.
Sean Campbell – SGS AXYS Analytical Services, Ltd.	**Laboratory Project Manager** Serves as a main point of contact for laboratory management of project work.

Name/Affiliation	Project Title/Responsibility
	Works closely with the Account Manager to manage contract work in accordance with contract requirements. Verifies completion of work in accordance with contract specifications
Dale Hoover-SGS AXYS Analytical Services, Ltd.	**Laboratory QA/QC Manager** Oversees laboratory QA/QC program. Monitors laboratory and method performance and analytical results for conformance with established quality standards. Verifies the completion of corrective actions to address any non-conformances.
Michelle Jasper – SVL Analytical, Inc.	**Technical Director** Oversees all laboratory operations Responsible for implementation of laboratory methodology Drive process improvements throughout the laboratory Facilitates meeting turnaround time expectations Communicates with Project Managers and SRRTTF-ACE
Michael Desmarais– SVL Analytical, Inc.	**Laboratory Quality Manager** Manages laboratory QA activities Responsible for accreditations and laboratory assessments Addresses non-conformances and assesses corrective actions Provides training in aspects of laboratory operations, data integrity, and ethics
Sophie Milam – SVL Analytical, Inc.	**Laboratory Project Manager** Serves as main point of contact for laboratory Manages client profile within SVL's electronic and physical database Reviews and distributes analytical reports Invoices clients for completed work Creates and submits pricing quotes for future work
Shawn Hinz – Gravity Environmental	**Conducts Sample Collection** Collects samples in accordance with QAPP and SAP Prepares and follows the Invasive Species Plan Prepares and administers Health and Safety Plan for employees Maintains equipment logs, field records and data sheets Transfers field data to Field Manager Manages field equipment, conducts calibrations Addresses nonconformance findings and responds to corrective actions

The lines of reporting for the organizations in the project are shown in the organization chart (Figure 1). Each team member has responsibility for performance of assigned quality control duties in the course of accomplishing identified activities. The quality control duties include:

- Completing the assigned task on or before schedule and in a quality manner in accordance with established procedures; and
- Ascertaining that the work performed is technically correct and meets all aspects of the QAPP.

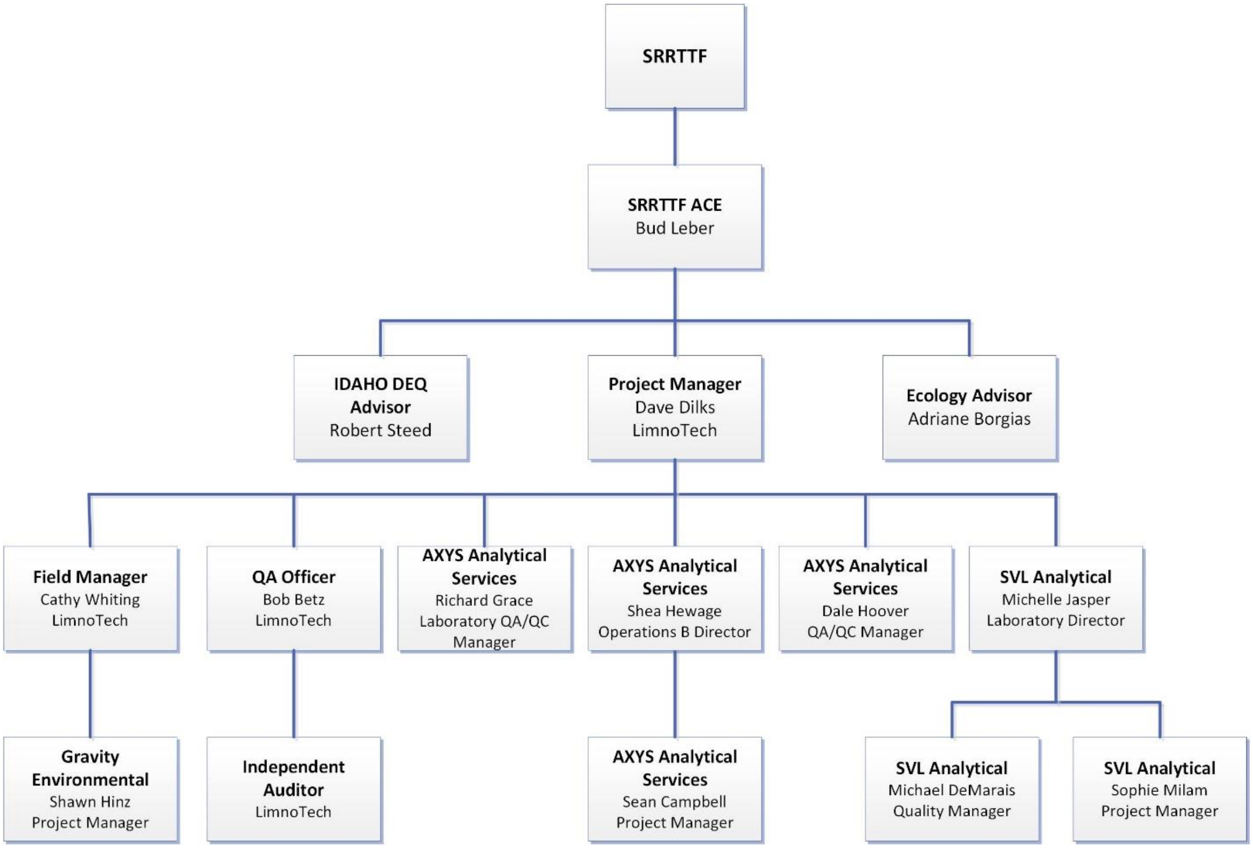

Figure 1. Project Team Organization

Budget

The budget for coordination and data analysis by LimnoTech for this project is $41,000. The costs for PCB analysis by SGS AXYS Analytical Services, Ltd, conventional parameter analyses by SVL Analytical, and field sampling by Gravity Environmental, will be covered directly by ACE via separate contracts.

Background

The Spokane River Regional Toxics Task Force (SRRTTF) has developed a comprehensive plan to reduce PCB inputs to the Spokane River and bring it into compliance with applicable water quality standards for PCBs established under the Clean Water Act. According to the State of Washington 2008 303 (d) list, the Spokane River and Lake Spokane exceed the water quality standard of 170 pg/L for polychlorinated biphenyls (PCBs) in several segments. Fifteen waterbody segments of the Spokane River and Lake Spokane (also known as Long Lake) and one segment of the Little Spokane River are on the 2012 303 (d) list for exceeding human health water quality criteria for PCBs in edible fish tissue. On November 15, 2016, the US Environmental Protection Agency (EPA) made a decision on Washington State's surface water quality standards, resulting in a revised water quality standard for PCBs of 7 pg/L.

PCB monitoring data for the Spokane River watershed available when the SRRTTF was formed provided an estimate of the amount of PCBs entering the Spokane River from contributing source area categories (e.g.

stormwater, WWTPs). Based on the Spokane River PCB Source Assessment 2004-2007 (Serdar et al, 2011), only 43% of the PCB source loading to the river between Stateline (RM 96.1) and Long Lake Dam (RM 33.9) could be identified. This is due in part to the uncertainty of the analyses and the high variability in the data. Those data indicated that sources of PCBs are very diffuse throughout the watershed, such that more data were needed to support development of a management plan with targeted control actions (LimnoTech, 2013). Two studies were conducted in 2014, the Confidence Interval Testing and the Synoptic Survey. An additional Dry Weather Survey was conducted in 2015 and monthly water quality sampling was conducted in 2016 to determine the seasonal variability in PCB concentrations in the Spokane River. Groundwater monitoring was also conducted in 2016. Results of the monitoring identified multiple potential groundwater PCB sources. These findings were incorporated into a Comprehensive Plan to reduce polychlorinated biphenyls (PCBs) in the Spokane River (LimnoTech, 2016b).

2018 Water Quality Monitoring

The objective of the 2018 water quality sampling is to collect the data necessary to repeat the semi-quantitative mass balance assessments conducted using the 2014 and 2015 Synoptic Survey data. Specifically, the monitoring is designed to provide supplemental information to address three gaps in understanding regarding groundwater PCB loading that exist from the prior studies:

1. The potential for groundwater loading sources between the Spokane USGS gage and Nine Mile Dam.
2. The specific nature groundwater loading sources suspected between Trent Avenue (Plante's Ferry) and Greene Street.
3. The potential for groundwater loading sources between Barker Road and Mirabeau Point.

The 2018 sampling locations are based on the work that has been done to date and includes a new station downstream of the Upriver Dam. Concurrent collection of flow data will allow for a semi-quantitative assessment of loading. Flow measurements will be made at the locations that do not have a USGS flow gaging station. The field monitoring program will consist of one synoptic survey conducted over the course of five days (3 to 5 samples per location), during the low flow period (August), as described below. Samples will be collected according to the requirements of the Sampling and Analysis Plan (LimnoTech, 2014c).

River locations are identified as in-stream samples and NPDES permitted sources are identified as discharge samples. The point of discharge is determined to be the location identified in the discharger's NPDES permit or as determined in the field by the sampling team and approved by the project manager. The sample locations are shown in Figure 2 and listed in Table 2.

Parameters

The study parameters include PCB congeners, total suspended solids (TSS), total dissolved solids (TDS), total organic carbon (TOC) and dissolved organic carbon (DOC). TSS, TOC and DOC will be used to provide information on the distribution of PCBs among various forms (i.e. purely dissolved, adsorbed to solids, sorbed to DOC), which will be needed if a fate and transport model is developed. TDS can be used as a tracer to provide information on groundwater contribution to the river. The parameters included in the 2018 Water Quality Monitoring are listed in Table 3.

Schedule

Key milestones associated with the project are described below along with their targeted completion dates:

Revise and approve QAPP	June 30, 2018
Conduct sampling events	August 2018

Data Validation	January, 2019
Report	February, 2019

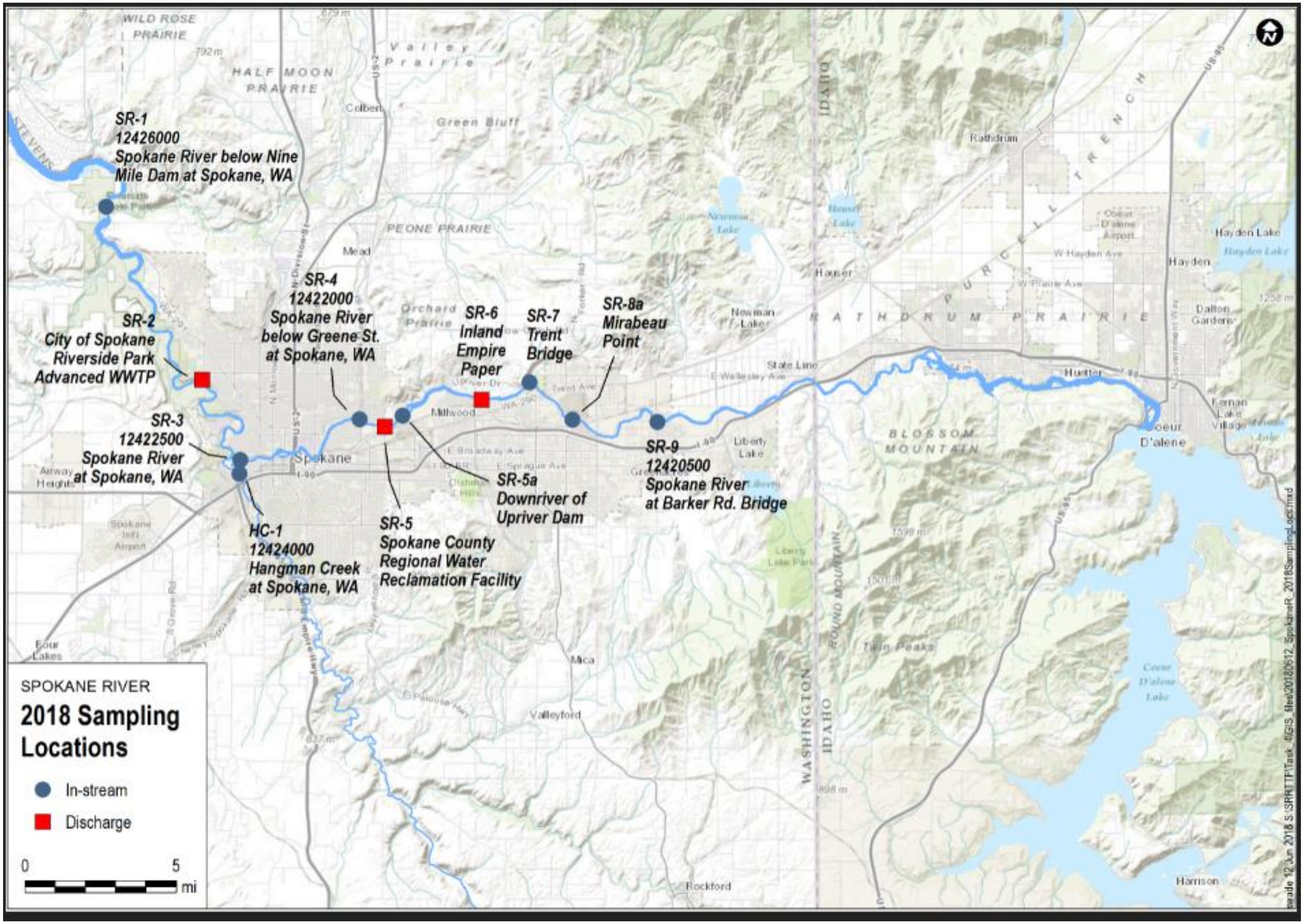

Figure 2. Spokane River 2018 Sampling Locations Map

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Table 2. Spokane River Monitoring Locations

Site	Location	Type of Sample
SR-1	Spokane River Below Nine Mile Dam	In-stream
SR-2	City of Spokane Riverside Park Advanced WWTP	Discharge
SR-3	Spokane River at Spokane	In-stream
HC-1	Hangman Creek	In-stream
SR-4	Spokane River at Greene Street Bridge	In-stream
SR-5	Spokane County Regional Water Reclamation Facility	Discharge
SR-5a	Downstream of Upriver Dam	In-stream
SR-6	Inland Empire Paper	Discharge
SR-7	Spokane River at Below Trent Bridge	In-stream
SR-8a	Spokane River at Mirabeau Point (upstream end of Mirabeau Park)	In Stream
SR-9	Spokane River at Barker Road Bridge (Greenacres)	In-Stream

Table 3. Spokane River Monitoring Parameters

Parameter	Type of Parameter
Polychlorinated Biphenyl (PCB) – 209 Congeners	Laboratory analytical
Dissolved Organic Carbon (DOC)	Laboratory analytical
Total Organic Carbon (TOC)	Laboratory analytical
Total Suspended Solids (TSS)	Laboratory analytical
Total Dissolved Solids (TDS)	Laboratory analytical
Temperature	In-situ measurement
Conductivity	In-situ measurement
pH	In-situ measurement
Dissolved Oxygen (DO)	In-situ measurement
Turbidity	In-situ measurement

Quality Objectives and Criteria

The data quality objectives are intended to clarify the study's technical and quality objectives, define the appropriate type of data, and specify tolerable levels of potential decision errors that will be used as the basis for establishing the quality and quantity of the data needed to support decisions. The data quality objectives for this study have been developed in order to ensure that the data collected are of acceptable quality and support the objectives of the project. The data quality objectives are described in Section 1.4 of the 2014 QAPP (LimnoTech, 2014b).

The 2018 data will be evaluated relative to the data quality objectives outlined in the 2014 QAPP (LimnoTech, 2014b). Data quality will be interpreted using the Data Quality Indicators (DQIs) which are the quantitative statistics and qualitative descriptors used to interpret the degree of acceptability of the data to the user. The DQIs include bias and precision, representativeness, completeness, comparability, and the required detection limits (sensitivity) for the analytical methods.

The Data Quality Indicators and the measurement performance criteria for each are provided in Tables 4 and 5. The number of samples collected per location is included in Table 6. The specifications for field instruments are included in Table 7.

It should be noted that there is no standard blank correction method, and numerous approaches are utilized, both nationally and within the Spokane River Basin. The selection of the most appropriate blank correction methodology must consider factors such as: study objectives, sample matrix, sampling methodology, expected range of results, and tolerance for biased results.

Table 4. PCB Data Quality Indicators

		BIAS	BIAS	BIAS		PRECISION	SENSITIVITY	COMPLETENESS
	Analytical Method	Daily Calibration Verification	Lab Control Sample Recovery*	Sample and Method Blank Surrogate Recovery	Method Blank	Duplicate Sample	Detection Limit (Level at which non-detects are reported)	Completeness Criteria
		% recovery limits	% recovery limits	% recovery limits	Concentration (pg/L)	RPD (valid for congeners > 10x EDL)	Concentration (pg/L)	%
PCB Con-geners	EPA 1668C /SGS AXYS Method MLA-010 Rev 12	50-145%	50-150%	25-150%*	Maximum = 180 pg/L (total PCBs) based on a 2.5L sample size). Laboratory will B-qualify congeners results < 3x the concentration in an associated blank	50%	1-20	95%

*Per SGS AXYS Method MLA-010 Revision 11 for OPR, internal standards and labeled compounds.

Table 5. Data Quality Indicators – DOC, TOC, TSS, TDS

DQI		BIAS	BIAS	BIAS	PRECISION	PRECISION	SENSITIVITY	COMPLETENESS
Parameter	Analytical Method	Lab Control Sample	Matrix Spikes	Lab Blanks	Replicate Samples	Matrix Spike Replicate	Detection Limit	Completeness Criteria
		% recovery limits	% recovery limits		RPD	RPD		%
DOC	EPA 415.3	80-120%	80-120%	< ½ EQL	30%	20%	1 mg/L	95
TOC	EPA 415.1	80-120%	80-120%	< ½ EQL	30%	20%	1 mg/L	95
TSS	EPA 160.2	80-120%	--	< ½ EQL	30%	--	1 mg/L	95
TDS	EPA 160.1	80-120%	--	< ½ EQL	30%	--	1 mg/L	95

Table 6. 2018 Sampling – PCB Sample Count

Site	Location	Type of Sample	Number of Individual Samples	No. of Samples Collected to be Composited	Number of Composite Samples
SR-1	Spokane River Below Nine Mile Dam	In-stream	5	5	1
SR-2	City of Spokane Riverside Park Advanced WWTP	Discharge	3	3	1
SR-3	Spokane River at Spokane	In-stream	5	5	1
HC-1	Hangman Creek	In-stream	5	5	1
SR-4	Spokane River at Greene Street Bridge	In-stream	5	5	1
SR-5	Spokane County Regional Water Reclamation Facility	Discharge	3	3	1
SR-5a	Downstream of Upriver Dam	In-stream	5	5	1
SR-6	Inland Empire Paper	Discharge	3	3	1
SR-7	Spokane River at Below Trent Bridge	In-stream	5	5	1
SR-8a	Spokane River at Mirabeau Point (upstream end of Mirabeau Park)	In-stream	5	5	1
SR-9	Spokane River at Barker Road Bridge (Greenacres)	In-stream	5	5	1

Table 7. Specification Limits of Field Measurement Instruments

Parameter	Instrument	Range	Accuracy	Resolution
Temperature	Hydrolab	-5 to 50°C	±0.10°C	0.01°C
	YSI	-5 to 45°C	±0.15°C	0.01°C
pH	Hydrolab	0 to 14 units	±0.2 units	0.01 units
	YSI	0 to 14 units	±0.2 units	0.01 units
Dissolved Oxygen	Hydrolab	0 to 20 mg/L	±0.2 mg/L	0.01 mg/L
	YSI	0 to 20 mg/L	±0.2 mg/L	0.01 mg/L
Conductivity	Hydrolab	0 to 100 mS/cm	±0.5% of range	1.0 uS/cm
	YSI	0 to 100 mS/cm	±1% of range	1.0 uS/cm
Turbidity	YSI	0-1000 NTU	±5% of range	0.1 units

Sampling Procedures

Monitoring is scheduled to be conducted in August 2018. Five rounds of sampling will be conducted at the in-stream locations and three rounds at the discharge locations. One archive sample will be collected for each PCB sample collected.

The samples will be collected by wading into the main channel flow, if possible. The best effort will be made without jeopardizing the safety of the sampling crew. The safety of the sampling crew is the top priority. Personal protective equipment will be required including the use of U.S. Coast Guard approved personal flotation devices.

The river flow will be monitored prior to initiating a sampling event to determine if conditions are safe for accessing the river.

https://www.avistautilities.com/environment/pages/waterflow.aspx

All sampling procedures described in the 2014 SAP (LimnoTech, 2014c) will be followed.

Sampling Initiation

The initiation of monitoring is designed with the intent to capture ideal dry weather conditions if possible, yet ensure that monitoring be conducted during the low flow period. Monitoring is scheduled to begin in mid-August. Prior to initiation of sampling the following conditions must be met:

- Two days have passed since the last rainfall greater than an average of 0.2 inches at the reporting precipitation stations in the City of Spokane MS4/CSO drainage basin.
- The local weather forecast contains no days with a predicted likelihood of rainfall greater than 50% for the following three days.

Once sampling is initiated, in-stream samples will be collected every day over a five day period. At each sampling station a single sample will be collected for discrete analysis and another sample to be analyzed as part of a composite of all five samples collected at that station, for all parameters. Compositing will be conducted by SVL Analytical.

Wastewater effluents will be sampled as grab samples on three separate dates, spaced evenly over the dry weather sampling period (Days 1, 3 and 5). Each sampling event will collect a single sample for discrete analysis and another sample to be analyzed as part of a composite of all three samples collected at that station.

One archive sample will also be collected for each PCB sample collected.

If a precipitation event exceeding an average of 0.2 inches at all weather stations occurs during the sampling period the following changes will be made to the sampling plan:

- If the precipitation event greater than 0.2 inches of precipitation (average of all weather stations) occurs after four days of sampling have been completed, the fifth day of sampling will be aborted.
- If the precipitation event greater than 0.2 inches of precipitation (average of all weather stations) occurs after three days or less of sampling have been completed, sampling will be suspended for two days and then resumed to complete five days of sampling.

Sample Handling and Custody

Sample handling will be the responsibility of Gravity Environmental and will be performed using methods as specified in the 2014 SAP (LimnoTech, 2014c), so that representative samples are collected, stored, and submitted to the laboratory for analysis. Sample containers, volumes, preservatives and holding times are summarized in Table 8. Proper sample handling and custody procedures will be employed as discussed in the 2014 QAPP (LimnoTech, 2014b).

Table 8. Guidelines for sample container preparation and preservation

Parameter	Container	Volume	Preservative	Holding Time
PCB	Amber glass	2.5 L	4º C	1 year
TSS	Polypropylene	1 L	4º C	7 days
TDS	Polypropylene	500 ml	4º C	7 days
TOC	Amber glass	40 ml	4º C, H_2SO_4	28 days
DOC	Amber glass	40 ml	4º C	28 days

Analytical Methods

The following section details the aspects of the analytical requirements, ensuring that appropriate analytical methods are employed. Tables 4 and 5 summarize the analytical methods to be used by the laboratory. Table 8 displays the required container type, sample volume, preservation, and hold time for the study parameters according to the previously referenced methods. SGS AXYS Analytical Services, Ltd. and SVL Analytical, Inc. will provide sample containers from a commercial supplier. All sample containers will be new and pre-cleaned by the supplier. In addition, the contract laboratories will provide sample labels for each bottle. The detection limits, expected concentrations, and analytical methods are included in Table 9 (Ecology, 2014).

Table 9. Parameters, Detection Limits, Expected Concentrations and Analytical Methods

Parameter	Matrix	Detection Limit	Expected Concentrations	Analytical Method	Laboratory
PCB (pg/L)	Water	1-20	10-10,000 total	EPA 1668C	SGS AXYS Analytical Services, Ltd.
TSS (mg/L)	Water	1	1-80	SM-2540D	SVL Analytical, Inc.
TDS (mg/L)	Water	1	1-80	SM-2540C	SVL Analytical, Inc.
TOC (mg/L)	Water	1	1-2	SM-5310B	SVL Analytical, Inc.
DOC (mg/L)	Water	1	1-2	SM-5310B	SVL Analytical, Inc.

Quality Control

Analytical quality control will be performed in accordance with the specified analytical methods and as presented in the 2014 QAPP (LimnoTech, 2014b).

Field Sampling Quality Control

Field sampling QC consists of collecting field QC samples to help evaluate conditions resulting from field activities. Field QC is intended to support a number of data quality goals:

- Combined contamination from field sampling through sample receipt at the laboratory (to assess potential contamination from ambient conditions, sample containers, sample transport, and laboratory analysis) – assessed using trip blanks/transfer blanks.
- Combined sampling and analysis technique variability, as well as sample heterogeneity – assessed using field replicates.

Trip Blanks – Trip blanks will be used to evaluate whether contaminants have been introduced into the samples due to exposure to ambient conditions or from the sample containers themselves. A trip blank is a controlled water sample, with minimal concentrations of contaminants of concern, which is produced by the laboratory. The trip blank accompanies the sampling equipment into the field and is stored with the analytical samples. Trip blanks will be collected at a frequency of 10% or one blank per sampling round.

Trip blanks, as described above, will be preserved, packaged, and sealed in the same manner described for the surface water samples. A separate sample number and station number will be assigned to each blank. If target analytes are found in the blanks above the criteria, sampling and handling procedures will be reevaluated and corrective actions taken. These may consist of, but are not limited to, obtaining sampling containers from new sources, training of personnel, discussions with the laboratory, invalidation of results, greater attention to detail during the next sampling event, or other procedures considered appropriate.

Field Replicate Samples – Field replicate samples will be collected to evaluate the precision of sample collection through analysis. Field replicates will be collected at designated sample locations by filling two distinct sample containers for each analysis. Field replicate samples will be preserved, packaged, and sealed in the same manner described for the surface water samples. A separate sample number and station number will be assigned to each replicate. The samples will be submitted as "blind" samples to the laboratory for analysis.

Field replicates will be collected for each analytical parameter at a frequency of 10% or one field replicate per sampling round, whichever is less. The replicate samples will be collected at random locations for each sampling event. If the acceptance criteria are exceeded, field sampling and handling procedures will be evaluated, and problems corrected through greater attention to detail, additional training, revised sampling techniques, or whatever appears to be appropriate to correct the problem.

Field Measurements Quality Control

Quality control requirements for field measurements are provided in Table 5.

Field instrumentation will be calibrated according to the manufacturer's requirements and will be calibrated daily. If a field instrument cannot be calibrated it should not be used.

Laboratory Analysis Quality Control

Laboratory QC is the responsibility of the laboratory personnel and QA/QC departments of SGS AXYS Analytical Services, Ltd. and SVL Analytical, Inc. The laboratory's QA Manual details the QA/QC procedures it follows. The following elements are part of standard laboratory quality control practices:

- Analysis of method blanks
- Analysis of laboratory control samples
- Instrument calibration (including initial calibration, calibration blanks, and calibration verification)
- Analysis of matrix spikes (TOC/DOC)
- Analysis of duplicates

The data quality objectives for SGS AXYS Analytical Services, Ltd. and SVL Analytical, Inc. (including frequency, QC acceptance limits, and corrective actions if the acceptance limits are exceeded) are detailed in 2014 QAPP (LimnoTech, 2014b). Any excursions from these objectives must be documented by the laboratory and reported to the Project Manager/Project QAO.

Corrective Action

Corrective actions will be implemented as required to rectify problems identified during the course of normal field and laboratory operations. Possible problems requiring corrective action include:

- Equipment malfunctions;
- Analytical methodology errors; or
- Non-compliance with quality control systems.

Equipment and analytical problems that require corrective action may occur during sampling and sample handling, sample preparation, and laboratory analysis.

For non-compliance problems, steps for corrective action will be developed and implemented at the time the problem is identified. The individual who identifies the problem is responsible for immediately notifying the Project Manager and the Project QAO.

Any non-conformance with the established quality control procedures outlined in the 2014 QAPP (LimnoTech, 2014b) will be identified and corrected. The Project Manager will ensure that a Corrective Action Memorandum is issued for each non-conformance condition. All non-conformance memoranda will be discussed in the final report submitted to the SRRTTF-ACE.

Field Measurements and Sample Collection

Project staff will be responsible for reporting any suspected QA non-conformance or deficiencies to the Field Manager. The Field Manager will be responsible for assessing the suspected problems in consultation with the Project Manager to review the sampling protocols and provide additional training if necessary. If it is determined that the situation warrants a corrective action, then a Corrective Action Memorandum will be issued by the Field Manager.

The Field Manager will be responsible for ensuring that the corrective action for non-conformance takes place by:

- Evaluating all reported incidences of non-conformance;
- Controlling additional work on nonconforming items;
- Determining what corrective action is needed;
- Maintaining a log of non-conformance issues;
- Reviewing responses to corrective action memoranda;
- Ensuring that copies of corrective action memoranda and responses are included in the project files.

No additional work will be performed until appropriate corrective action has been implemented and documented in response to the corrective action memoranda.

Laboratory Analyses

Corrective actions are required whenever laboratory conditions, instrument malfunction or personnel situations have led or could potentially lead to errors in the analytical data. The corrective action taken will be dependent on the analysis and the event.

Laboratory personnel are alerted that corrective actions may be necessary if:

- QC data are outside the acceptable range for precision and accuracy;
- Blanks contain target analyses above acceptable levels;
- Undesirable trends are detected in spike recoveries or RPD between duplicates;
- Excessive interference is noted; or
- Deficiencies are detected by the Independent Auditor during laboratory system audits as described.

Corrective action procedures are often handled at the bench level by the analyst, who reviews the preparation or extraction procedure for possible errors, checks the instrument calibration, spike and calibration mixes, and instrument sensitivity, etc.

Corrective action taken within each laboratory is the responsibility of the Laboratory Operations/Technical Director. When a problem occurs, the Laboratory Technical Director informs the Project Manager about the problem and the steps taken to resolve it. Once the problem is resolved, full documentation of the corrective action procedure will be submitted to the Project Manager.

All non-conformance memoranda initiated by the contract laboratory will be discussed in the case narrative or included in the laboratory reports. The Project Manager will follow-up on all corrective actions that are taken to ensure that the memoranda are accurate.

Data Management

Data management will be conducted as described in the 2014 QAPP (LimnoTech, 2014b).

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